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EDITORIAL.

Fruit Research in Java.

The recent visit of Mr. J. N. Milsum to Java to study fruit cultivation in that country, an account of which will be found in this number, again brings to the fore the subject of fruit cultivation in Malaya to which we drew attention in last month's number of this Journal. On that occasion, our comments dealt mainly with the economics of fruit-growing in Malaya. The present article in concerned more particularly with the technical aspect of the subject.

The Horticultural Bureau of the Department of Economic Affairs is responsible for the fruit work in Java and Sumatra. With three research experiment stations and twelve European officers it has been possible to initiate research work along several lines and results of great value are already emerging from this organisation. We are indebted to the Government of Netherlands India and particularly to the Head of the Agriculture and Fishery Service, Java, and to his officers, for providing facilities for Mr. Milsum to see the work in progress, and for permission to publish his report in this Journal.

The work of the Bureau of Horticulture is concerned not only with scientific research on fruit culture, including economic investigation of distribution and yields of the different kinds of fruit trees, but also with the supply of large quantities of good quality planting material.

Perhaps the most interesting aspect of this work is the method adopted for raising large quantities of good varieties of fruit for distribution. Technique in this respect has advanced considerably in recent years. In this connexion, it is noted that in many cases, the method now adopted of raising stocks of planting material results in early fruiting. Perhaps the greatest deterrent to fruit-growing in this country is the length of time which must elapse before any return on outlay may be expected. It is largely for this reason that fruit growing is confined to cultivation on a small scale. The production of good fruit in a shorter period should encourage cultivation on a larger scale.

In a comparison between fruit-growing in Malaya and Java one cannot avoid reference to climatic differences between the two countries. Java experiences more defined seasons than does Malaya, a factor of profound importance in fruit-growing. With our more equable climate, the choice of fruits which may be cultivated successfully is more limited than in Java. The difficulty

is not so much that the fruits cannot be grown successfully, but that flavour is affected. It is perhaps dangerous at this juncture to particularise, but at a venture, we suggest that Malaya will always prove less suitable than Java for citrus fruits and mangoes. On the other hand, there are a large number of fruits, such as rambutans, mangosteens and chikus, particularly suited to our climate, and while we would not suggest neglect of research work in Malaya on the citrus fruits, we do emphasise the prospects of early improvements by concentration on varieties of fruits well-suited to local conditions and on the wide distribution of improved stock throughout the country.

Agriculture in Labuan and Brunei.

The Director of Agriculture paid a visit to Labuan and Brunei in 1932 to advise the Governments concerned on the agricultural development of these territories. His report included a scheme for the establishment of agricultural services, designed in particular to effect improvement in the agriculture of the small-holder. An account of this visit, in so far as it concerned agriculture in Brunei, was published in the *Malayan Agricultural Journal* in November 1932.

The recommendations put forward as a result of that visit have been adopted by these two Governments, in so far as the financial position permitted, and an agricultural service has been inaugurated. At the present time the work is under the Agricultural Field Officer, Singapore, who makes periodical visits, but it is expected that in the near future, a senior agricultural officer will be resident in Brunei. The nucleus of an Asiatic staff has been appointed and is receiving training at the School of Agriculture, Malaya, and at other Stations of the Department of Agriculture in this country.

In the meantime, work has progressed towards the establishment of suitable agricultural stations in both Labuan and Brunei. Work is necessarily somewhat restricted in the absence of personnel, but as will be realised by the article on Agricultural Progress in Labuan and Brunei, which is published in this number, the foundation for future work is being well laid and will prove a great saving of time at a later date when the staff is available to develop the present projects.

Original Articles.

FRUIT CULTIVATION IN JAVA*

BY
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Introductory.

Owing to differences in climate and soil, Java is well suited for the production of almost all tropical fruits. A large indigenous population, mainly composed of small landowners, has resulted in extensive areas of fruit being planted, and in many districts fruit cultivation is an important item of native agriculture.

It is not possible in this place to record in detail the investigations conducted by the Bureau of Horticulture of the Department of Agriculture and Fisheries, regarding native fruit production in Java. The results of a detailed enquiry, made in 1925-1926 in the surroundings of Batavia were published in *Landbouw*, II, 1926—1927, p. 923. It is shown that in two districts, Meester Cornelis and Kebajoran, in the residency of Batavia, a total area of 23,520 acres was planted with fruit trees. Each inhabitant possessed half an acre of land containing fruit trees. Small areas of rice fields and arable land were owned in addition. The number of ponies and cattle in the two districts was considerable and averaged one animal to every two acres of land cultivated. The manure obtained from this stock is extensively used for manuring the fruit trees. The enquiry disclosed the fact that the average number of fruit trees per acre, in the two districts named, was 33, not counting banana plants and salak palms, *Salacca edulis*.

From an inspection made in part of these districts by the writer in April, 1934, it appeared that fruit cultivation had increased and is the main source of income of the inhabitants.

The soil is rather poor, but by its physical condition well suited to the cultivation of all fruit trees, excluding mangoes and bananas. Rubber is not planted. A system exists whereby almost every landowner undertakes to rear a heifer or young bull for dairymen living near the large towns, in return for the manure obtained. A small cash payment is, in some cases, made to the landowner when the animal is returned to its owner. Ponies and goats are also kept on many holdings. The animals are stalled in small bamboo shelters with atap roofs and fed almost solely with grass clippings, collected from adjacent open spaces. Working ponies receive a small daily ration of rice bran. The pen manure thus obtained is utilized in manuring the fruit trees in the various holdings. The advantage of consistent manuring, especially of pomeloes, appears to be fully realized, and large crops of fruit are obtained as a result of this practice.

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* The following article is written as the result of a visit to Java during the period 22nd. April to 5th. May, 1934. A week was spent at Ragoenan Experiment Station, when a close enquiry was made regarding experimental fruit cultivation with special reference to methods of propagation.

Distribution of Fruit Cultivation.

Fruit trees are extensively grown in West Java, between Batavia and Buitenzorg. Those of special importance are pomelo, rambutan, and chiku. Mangoes are largely grown in East Java, where the marked dry monsoon suits the requirements of this important fruit. Centres of production are Madoera and Pasoeroean; also Cheribon and Indramajoe on the northern coast between West and Mid-Java. Oranges thrive best at high elevations and are extensively grown at Malang and Garoet. Mangosteens are produced in West Java and also at Jogjakarta. Bananas are grown on a large scale at Banjoewangi in East Java, and exported in some quantity to Australia.

The production and distribution of fruit in Java is dealt with in detail in *Mededeeling van de Afdeeling Landbouw*, No. 19, Vruchtenhandel en Cultuur in Nederlandsch-Indie. As an indication of the internal fruit trade in Java, it may be stated that the transport of fresh fruit on the State Railways in 1929 amounted to 70,000 metric tons valued at approximately seven million guilders. The export of fruit from Java to the outlying districts of the archipelago in 1930 amounted to 3,662 metric tons valued at 446,000 guilders. Outside the Dutch East Indies the principal port of destination is Singapore. In 1930, 1,697 metric tons of fruit valued at approximately 170,000 guilders were thus exported. Some 216,600 bunches of bananas were shipped from Banjoewangi to Western Australia. The cultivation, marketing and shipping of fruit is almost entirely in the hands of natives.

With regard to the return obtained by the growers, investigations disclosed some interesting facts. At Garoet, the citrus centre, in 1929, the average proceeds derived from the sale of fruit amounted to guilders 43.75 per compound per annum, representing approximately 21 per cent. of the total income. In the Batavia district, the most important fruit centre in Java, this figure amounted to 45 per cent. The mango-growing districts produced fruit valued at 5,330,000 guilders, whilst in the districts surrounding Batavia the proceeds arising from the cultivation of fruit trees were estimated at six million guilders.

The Annual Report of the Horticultural Division for the year 1932 shows that fruit production in Java is of great importance and, owing to the thickly populated towns, a large amount of internal transport by rail is necessary to meet the demand. Approximately 12,065 metric tons of fruit were carried by rail from Batavia to the different residencies, the majority being distributed in West Java. The quantity of oranges and mangoes from East Java transported by the State Railway amounted to 1,050 metric tons and 4,860 metric tons respectively. Persimmons and oranges from Garoet amounted to 919 metric tons and 604 metric tons. A total of 903 metric tons of mangosteens were railed from the surroundings of Jogjakarta. Shipment of fresh fruit to Singapore amounted to 1,140 metric tons, mainly from Soerabaja, Cheribon, Bali, and Batavia.

Work of the Horticultural Bureau of the Department of Economic Affairs.

The bureau is administered by the Head of the Agricultural and Fishery Service with a Horticultural Adviser and two technical assistants. These officers are stationed at headquarters in Batavia. Some twelve European officers are engaged on fruit work in Java and Sumatra. Three research experiment stations are controlled by the bureau; Ragoenan near Batavia; Bedali near Malang, and Pasoeroen, both in East Java. Ragoenan is the main experiment station and is dealt with in detail in this article. The experiment station known as Bedali, is situated 1,575 feet above sea-level and is concerned with the experimental cultivation, and propagation for distribution, of oranges, mandarins, and lemons. The average yearly rainfall is 74 inches. This station, comprising 22 acres, was opened in 1928 in order to encourage the cultivation of citrus in East Java.

Mangoes thrive exceedingly well on the plains in East Java and receive particular attention at an experiment station, (area 30 acres) known as Pohdjentrek, near Pasoeroean. This station, opened in 1919, is situated on the plains and has an average yearly rainfall of 52 inches. Trial plots and experiment stations number about thirty, and are distributed throughout the main fruit-growing districts of the country. Several are situated in the hills with the object of assisting settlers, including Europeans, in the production of hill fruits such as oranges, grape fruits, avocado pears, and persimmons.

The main lines of work undertaken by the Horticultural Bureau are as follows —

(i) Research in fruit culture.
(ii) Supply of good quality planting material.
(iii) Supervision of local fruit distribution.
(iv) Chemical examination of fruit varieties.
(v) Bee-Keeping in relation to fruit cultivation.
(vi) Recording native fruit crop yields.

Investigations concerning diseases and pests are conducted at the Institute for Plant Diseases, Buitenzorg.

Fruit Culture at Ragoenan Experiment Station, Pasar Minggoe.

This experiment station, opened in 1921, is situated some 12 miles south of Batavia. Three estates make up the station and comprise 500 acres, of which about 320 acres are under cultivation. The station is concerned solely with research in connexion with fruit cultivation, and since it is in the centre of a large fruit-growing district, is particularly well suited for the purpose.

Soil.—The soil at the station is similar to that in the Batavia district and thence to the foot of the mountains. It consists of an ancient andesite tuff laterite of very great depth. The surface soil is deep red in colour with an almost

complete absence of sand. Although described as a clay, the soil is very porous and crumbles readily when dry. It contains about 4 per cent. of organic matter and 0.1 per cent. of lime. A remarkable feature is the small amount of potassium present (0.005 per cent. soluble in 2 per cent. citric acid solution). Plant growth shews ready response to phosphates and nitrogenous manures when applied to this soil. During wet weather the soil is particularly sticky and difficult to work but it soon dries out. Artificial irrigation is necessary during the dry monsoon and a comprehensive system of irrigating channels has been installed.

Climate.—The average rainfall at Pasar Minggoe is 90 inches per annum. The main precipitation is from November to April, known as the West Monsoon. During the East Monsoon, *i.e.* May to October, the rainfall is considerably less with some rather dry periods. Temperatures appear to be very similar to those obtaining in Malaya.

The Technique of Fruit Tree Propagation.

Ragoenan Experiment Station was selected originally as a suitable site to conduct investigations in fruit culture, since it is in the centre of the most important fruit-growing district in Java. Material of the major fruits has thus been collected without much difficulty. With regard to the indigenous fruits such as pomelo, rambutan, and duku, and others of less importance, the opportunity has been taken of attending all exhibitions and tracing the trees that have produced fruit of superior quality. Periodical inspections are made during the fruiting season in all small holdings, and trees of superior quality marked and numbered. Since all fruits are propagated asexually, it has been found possible to gather together a representative collection of the finest fruits occurring in Java. In the course of these trials many selected trees have been discarded, and so far as possible only those varieties of superior quality and practical value are retained and propagated for distribution. Exotic fruits, such as citrus, avocado pear and mango, have been imported. Considerable research has been necessary to ascertain suitable stocks for these importations, especially for the commercial varieties of citrus.

Nurseries for Raising Stocks.

The standard method at Ragoenan of propagating almost all tropical fruits is by budding, mainly on to seedling stocks. Since the future behaviour of the fruit tree depends to a great extent upon a well-grown stock, it is of paramount importance that this branch of nursery work be given proper attention. The question of suitable stocks for different fruits is dealt with under a subsequent heading. It is proposed to record here how stocks should be raised.

The site of the seed bed should be on good soil that is well drained and capable of producing strong seedlings. It should be situated as near as possible to a water supply as watering during dry weather is often necessary. At

JACK FRUIT IN NURSERY
Young trees four months old from budding.

RAMBUTANS IN NURSERY
Rambutan Seenjonja on Rambutan Seematjan stocks, three months after budding

Budded Rambutan
Five Years from Planting.

Orange in Bearing
Valencia Late Orange on Rough Lemon Stock, Nine years old.

Ragoenan Experiment Station, where dry weather is experienced during the East Monsoon, artificial irrigation is undertaken. On present information it is doubtful whether this is essential in Malaya, although probably advantageous. The beds should be 4 feet wide, of convenient length, with paths 18 inches to 2 feet between each bed. The size of the seedling beds at Ragoenan is 50 feet by 4 feet, and this size is taken as a standard throughout this report.

The cultural treatment will naturally depend upon the tilth and fertility of the soil. Assuming that the land has been under cultivation previously, the soil should be rested before use and planted with a suitable cover crop, e.g. *Calopogonium mucunoides*. When required for use the beds should be deeply trenched and the green matter dug into the soil. Well-rotted cattle manure is then placed on the land at the rate of about 1,000 lbs. per bed. This is incorporated into the soil by a second digging. The amount of cattle manure applied to the land each time it is required for raising seedling stocks appears extraordinarily heavy, but experience has proved that to obtain satisfactory results, this is necessary. A dressing of artificial fertilizers is then applied to the beds and raked in. The usual dressing is a mixture of basic slag (4 lbs. per bed) and sulphate of potash (2 lbs. per bed). The bed is then in a suitable condition for sowing the seeds.

A light high shade is considered an advantage and *Sesbania grandiflora*, a light-leaved leguminous tree, may be used for this purpose. A few trees per acre of nursery only should be planted, since it is necessary to prevent root competition with the fruit seedlings.

In seed-sowing the procedure adopted varies according to the kind of fruit stock it is desired to raise. Fruits, such as the rambutan, durian, jack fruit, guava, duku, and avocado pear, are sown in three rows one foot apart, the seeds being spaced one foot apart in the rows. A light shade of rough ataps* placed on a bamboo structure two feet above the soil, is necessary, since the shade assists the seedlings during the early stages of growth. Regular watering and weeding is essential after sowing, and at all times the soil should be kept stirred in order to provide a surface mulch. The attacks of injurious insects must be guarded against. When the seedlings are about six months old, the tap root is cut back several inches by means of a long knife inserted beneath the soil. This operation should be carried out during wet weather. When the seedlings reach the atap roof of the shelter, shade is gradually removed in order to harden the seedlings preparatory to budding. Under suitable conditions the seedlings are ready for budding one year after sowing. Should growth be slow during the seedling stage, one or more applications of a nitrogenous fertilizer *e.g.* sulphate of ammonia, at the rate of 1 lb. per bed, may be applied to the soil between the plants and raked in. The treatment of the seedling beds is outlined in tabular form below —

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* Ataps: a roof of leaves.

Treatment of Seedling Stock Beds.

Area	Cattle manure	Artificial fertilizers.	Period of growth.
50 ft. x 4 ft.		4 lbs. basic slag.	
		2 „ sulphate of potash.	
(200 sq. ft).	1,000 lbs.	1 lb. sulphate of ammonia.	One year.
		(one or more applications).	

Citrus stocks require rather different treatment from that outlined above. As is generally known, citrus plants are very liable to insect attack, and to secure clean growth during the seedling stage the beds are enclosed in a covering of light cambric. This is a necessary precaution against the leaf miner, *Phyllocnistis citrella*. The seedlings are transplanted before being used for budding.

The seeds are sown with the pointed end downwards to secure straight taproots. The distance of planting is about 2½ inches apart either way. After sowing, the entire bed is covered with white cambric, placed over a bamboo structure two feet from ground-level.

Germination of most stocks takes place within 3 to 4 weeks. Under average condition, the citrus seedlings are fit to be transplanted when six months old. They are carefully lifted from a moist seed bed and the taproot cut back a few inches, and planted in similar beds in three rows, each seedling being spaced one foot apart. A cambric covering is used for a further month to encourage the seedlings to become established. Budding may be undertaken one year after sowing the seeds.

Several other factors require mention with regard to the two principal citrus stocks used in Java; namely, propagation from cuttings and selection of seedling stocks. Both the rough lemon and Japanese citron may readily be raised from cuttings and serve equally well for stocks as seedlings. Cuttings about one foot long of hardened wood are selected and planted deeply in prepared beds under cambric covering. The exposed cut surface is coated with a mixture of paraffin wax (92 per cent.) and carbolineum (8 per cent.) in order to guard against fungus attack. Cuttings so treated produce roots in 4 weeks and may be transplanted a month later. Budding may be undertaken when the cuttings are six months old, and these are ready for transplanting at least six months earlier than seedlings. In citrus the growth of the scion is considerably influenced by the stock. The seedlings of most stocks are partly of vegetative and partly of generative type. It is necessary to discard the latter, since only vegetative seedlings should be used for budding. Weak seedlings and those with deformed taproots should be rigorously excluded. This subject has been dealt with by Dr. H. T. Toxopeus, in *Landbouw* VII, No. 10. In practice,

it is found that only 30 per cent. of Japanese citron seedlings and 70 per cent. of rough lemon seedlings are suitable for use. Should the seedlings begin to form side branches at any time, the branches should be removed, as a single stem is required for budding.

It will be seen from the preceding remarks that the amount of work in connexion with raising budded fruit trees is considerable. The actual cost, including supervision, of producing budded trees at Ragoenan Experiment Station made it necessary to charge 35 and 75 guilder cents per plant, to Asiatic and European, respectively.

Budding.

The usual method of budding is a modification of the Forkert method. While seedlings and cuttings can be readily grafted by several different methods, these are not commonly practised, since budding is so much simpler, quicker, and more economical of budwood than is any method of grafting. Budding is generally performed during the rainy season when the bark is in an active state of growth. Most fruits, however, may be budded at Ragoenan throughout the year, suitable conditions being indicated when the bark will separate readily from the wood. Javanese labourers become very adept at budding, and a skilled workman will bud 400 stocks per day, provided that the budwood is supplied to him.

Budding by the modified Forkert method consists in making a transverse incision in the bark of the stock as far as the cambium, after which the bark over a length of $1\frac{1}{2}$ inches and a width of $\frac{1}{3}$ inch is pulled down, either as one piece or else in several small strips. Should the bark fail to peel properly or tear off in small pieces, this indicates that the cambium is inactive and in an unsuitable condition for budding. Success by this method is greatest just before new shoots are produced.

In the ordinary Forkert method, which was used formerly with very unsatisfactory results, the bark is not pulled down, but is cut loose. The modified Forkert method, has the advantage that, before commencing operations, it is possible to ascertain whether the stock is fit for budding. Further, accuracy is possible in removing the bark of the stock exactly to the cambium layer without cutting and removing any wood.

From the strips of bark torn loose, two thirds are cut off, and the ends trimmed. A shield-shaped bud with no wood adhering is then inserted and bound up with raffia. With the majority of fruits waxed tape is unnecessary.

The budwood obtained from selected trees, is usually cut into pieces about one foot long, each piece carrying a number of dormant buds. The budwood should be of good normal growth, well-rounded and sufficiently hardened to permit of handling. Generally, non-petioled budwood about one year old is used, but at times this is difficult to obtain. When leaves are present on the previous year's wood, suitable budwood may be obtained by removal of the leaves about three weeks before use. This is often necessary in the case of rambutans.

A knife of fine steel is employed and a hone kept at hand to enable the knife to be sharpened as often as necessary. A cloth is used to remove any moisture or soil adhering to the stem of the stock.

The distance of the bud from the ground is determined by the conditions under which the trees are to be used. Certain citrus stocks are liable to be affected by fungus disease should the bud union come in contact with surface water or damp soil. For this reason, where the budded trees are to be planted in moist situations, high budding is undertaken. With other fruits, less liable to collar disease than citrus, or where the land is drier, the bud may be within three inches from the ground.

About three weeks after budding, the raffia is removed and the scion commences to grow. The portion of the stock above the union is cut back to within four inches of the growing bud. Three months later the remaining portion of stock wood above the sprouted bud is carefully removed. After growth commences it is necessary to provide a bamboo stake, from two to three feet high, to each tree, and to tie the shoot to the stake from time to time with strong raffia or coarse string. This is of considerable importance, since it is during the early stages of growth that a strong single stem should be formed. When the shoot is about three feet high it is generally topped, thus commencing the formation of a framework for the tree. The majority of fruit trees are sufficiently advanced for transplanting within six months to one year from budding.

While the plants are in the nursery, regular attention is given to insect control by spraying with lead arsenate and soap and kerosine emulsion. Citrus trees are sprayed with Bordeaux mixture two months before transplanting as a preventative against Diplodia. Budded stocks of certain fruit trees such as the rambutan, durian and duku, are difficult to transplant from the nursery. When preparing such trees for despatch by rail it is necessary to establish them in large bamboo baskets. The young trees are gradually hardened by removing the lower portion of the taproot and side shoots whilst in the nursery beds. After the trees have been placed in bamboo baskets they are kept under shade for a month until fresh growth commences. Those successfully established are gradually moved into full light and are then ready for despatch. The chiku and duku are both difficult fruits to raise as budded plants, the former because its growth is slow and the latter owing to its dislike of root disturbance.

Treatment of Various Fruit Trees.

The results of ten years' experimental work with the vegetative propagation of a large number of fruit trees, obtained in the different experiment stations in Java, have been published in *Landbouw* VI, No. 10, p. 944. It is not possible to refer to these results in detail, but the summarized table below records briefly the experience gained at Ragoenan Experiment Station. Citrus requires further explantion, since the work undertaken with these important fruits is extensive. This is dealt with under a separate heading.

Results of Stock Experiments at Ragoenan Experiment Station.

The following abbreviations are used under the headings of Budwood, and Season of Budding —

n = non-petiolated budwood.
p = petiolated budwood.
n/p = either non-petiolated or petiolated budwood.
1 = one-year-old wood.
2 = two-year-old wood.
w = rainy season.
d = dry season.

Scion.	Stock.	Age of stock months.	Budwood.	Season of Budding.	Successful buds. per cent.
Anacardiaceae					
Anacardium occidentale Cashew Nut.	*A. occidentale* Cashew Nut.	6	n 1	w	85
Mangifera indica Mango vars.	*M. indica* Mango seedlings	12	p 1	d	80-90
	M. foetida Bachang	12	p 1	d	70
	M. odorata Kohini	10	p 1	d	80-90
Spondias dulcis 'Kadongdong'	*Spondias dulcis* 'Kadongdong'	10	n 1	w	45
Annonaceae.					
Annona muricata. Soursop.	*Annona muricata* Soursop.	10-12	n 1	d.w.	100
Annona reticulata Bullock's Heart	*A. muricata* Soursop.	10-12	n 1	d.w.	95-100
Annona squamosa Custard Apple	*Annona squamosa* Custard Apple.	12	n 1	d.w.	95
Bombacaceae					
Durio zibethinus Durian.	*Durio zibethinus* Durian.	9	n 1	w	90
				d	40
Caricaceae.					
Carica Papaya Papaya	*Carica Papaya* Papaya.	5	n 1	d	90
Euphorbiaceae.					
Baccaurea Motleyana Rambai.	*Baccaurea Motleyana* Rambai.	14	n 1	w	50
	B. recemosa	14	n 1	w	50
Flacourtiaceae.					
Flacourtia indica Rokam.	*Flacourtia indica* Rokam.	22	n 1	w	80
	F. inermis Lovi-lovi	9	n 1	w	80
Flacourtia inermis Lovi-lovi.	*Flacourtia indica.* Rokam	22	n 1	w	90
	F. inermis Lovi-lovi	9	n 1	w	90

Scion.	Stock.	Age of stock months	Budwood	Season of Budding.	Successful buds per cent.
Lauraceae.					
Persea americana Avocado Pear	*Persea americana* Avocado Pear.	9	n l	w	80
Meliaceae.					
Lansium domesticum Duku.	*L. domesticum* Duku.	48	n l	w	60
Sandoricum Koetjape Kechapi	*Sandoricum Koetjape* Kechapi	11	n l	d.w.	60
Moraceae.					
Artocarpus integra Jack Fruit.	*A. integra.* Jack Fruit.	10-12	n l	d.w.	50-95
	A. Champedan Champedak	10-12	n l	d.w.	50
	A. rigida. Tampunai	12	n l	d.w.	50
Artocarpus communis. 'Sukun'	*Artocarpus rigida* 'Tampunai'	12	n l	d.w.	50
Artocarpus Champedan 'Champedak'	*Artocarpus integra* Jack Fruit.	10-12	n l	d.w.	50
Myrtaceae.					
Eugenia aquea 'Jambu ayer'	*Eugenia javanica* Wax jambo.	12	n l	w.	70
	E. densiflora (wild species in Java)	11	n l	w.	85
Eugenia javanica Wax jambo	*Eugenia javanica* Wax jambo.	12	n l	w.	95
	E. densiflora	11	n l	w.	90
Eugenia Jambos 'Jambu ayer mawar'	*Eugenia javanica* Wax jambo.	12	n l	w.	90
	E. densiflora	11	n l	w.	90
Eugenia malaccensis 'Jambu bol'	*Eugenia malaccensis* 'Jambu bol'	12	n l	d.w.	95
Psidium Guajava Guava	*Psidium Guajava* Guava.	13	n l	d.w.	100
Oxalidaceae.					
Averrhoa Bilimbi 'Bilimbing buloh'	*Averrhoa Bilimbi* 'Bilimbing buloh'	9	n l	d.w.	100
Averrhoa Carambola. Carambola.	*Averrhoa Carambola* Carambola.	12	n l	w.	100
Rutaceae.					
Citrus aurantifolia Lime.	*Citrus nobilis* hybrid Japanese citron	12	n/l	d	90
	Citrus Limonia Rough Lemon.	12	n/l	d	90-95
Citrus sinensis Sweet Orange vars.	*Citrus nobilis* hyb. Japanese citron.	12	n/p l	d	95
	C. Limonia Rough lemon.	12	n/p l	d	95
	C. sinensis Local sweet orange.	12	n/p l	d	95

Scion.	Stock.	Age of stock months.	Budwood.	Season of Budding	Successful buds. per cent.
Citrus Limonia Lemon varieties	*Citrus nobilis* hyb. Japanese citron.	12	n/l	d	90
	C. Limonia Rough lemon.	12	n/l	d	90
Citrus medica Citron.	*Citrus nobilis* hyb. Japanese citron.	12	n/l	d	80
Citrus maxima Pomelo	*Citrus nobilis* hyb. Japanese citron.	12	n/p l	d	90-100
	C. Limonia Rough lemon.	12	n/p l	d	90-100
	C. sinensis Local sweet orange.	12	n/p l	d	90-100
	C. maxima. Pomelo vars.	12	n/p l	d	90-100
	C. Aurantium Saramacca citron (sour orange).	12	n/p l	d	90-100
Citrus nobilis var. Mandarin orange	*Citrus nobilis* hyb. Japanese citron.	12	n/p l/2	d	90
	C. sinensis Local sweet orange.	12	n/p l/2	d	80-96
Sapindaceae.					
Nephelium lappaceum Rambutan vars.	*Nephelium lappaceum* Rambutan.	12	n/l	w	90-100
Nephelium mutabile Pulasan vars.	*Nephelium mutabile* Pulasan.	12	n/l	w	90
Sapotaceae.					
Achras sapota Chiku varieties.	*Achras sapota* Chiku.	36	n/l	d/w	60

Certain fruits, such as mangosteen, duku, chiku and several of the Eugenias, have proved either not amenable to treatment as budded trees, or unsatisfactory on account of the time taken to mature. It would appear that, in such cases, etiolated shoots or marcotted plants might be planted with advantage. Investigations on these lines offer great possibilities, since it may be found possible to select and propagate suitable stocks for such fruit by vegetative reproduction.

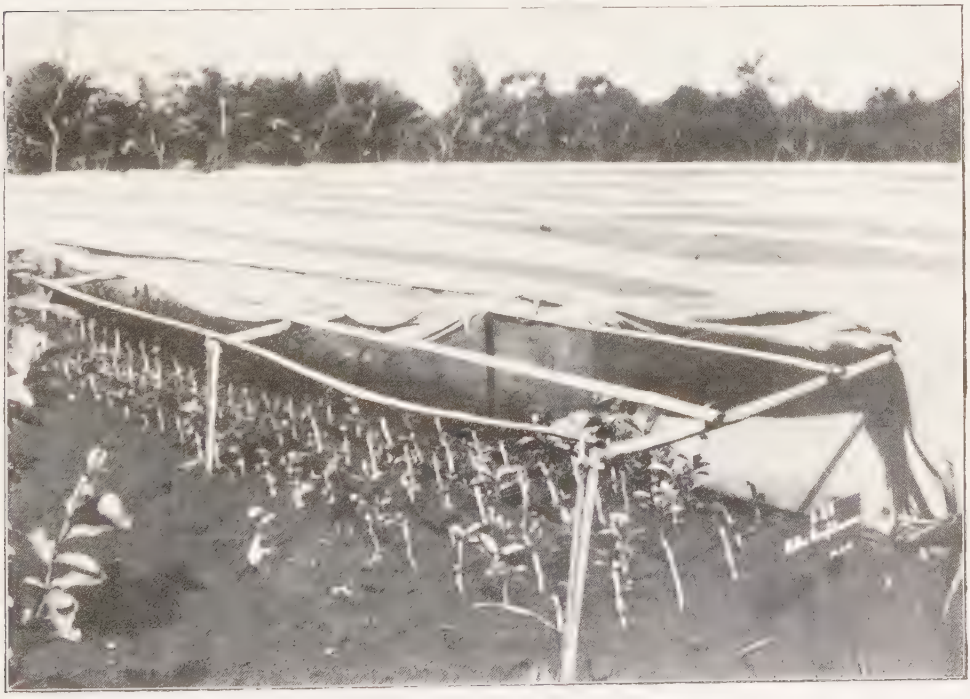
Citrus Culture.

In the following tabulated list those citrus which have proved suitable in Java are recorded, with remarks regarding any special requirements :—

Citrus.	Varieties.	Remarks.
C. medica	Citron	Little economic importance.
C. Limonia	Pondorosa lemon	Thrives from 4000 feet downwards.
	Villafranca lemon	Used in manufacture of lime-squash.
C. aurantifolia	Lime	Generally cultivated.
	Tahiti lime	Grown on sour orange stock.
C. maxima	Pomelo	Most successful on the plains.
	Delima	European market.
	Balema	,,
	Pandanlima	,,
	Bali	Chinese market
	Seemanalagi	,,
	Pandan wangi	Native market.
	Pandan bener	,,
C. paradisi	Grape Fruit	Thrives from 5000 feet downwards with greater success on the hills.
	Duncan, Marsh Seedless, MacCarty, Triumph	Imported varieties.
	Manis besar	A local type that succeeds on the plains.
C. Aurantium	Sour orange	Resistent to disease but of little importance.
	Bigaradier	
	Saramacca citron	An imported rootstock.
C. sinensis	Sweet orange, Washington Naval, Valencia Late, Norris, Jaffna, Hamlin	From 3500 feet downwards. Greatest success is obtained on the hills with these imported varieties.
	Pineapple	An excellent fruit at Ragoenan.
	Manis	A local form. European market.
C. nobilis	Mandarin orange	From 3500 feet downwards.
	King orange	Successful on the plains.
	Siam	
	Satsuma	
	Tjeena Leetjin	Local form.

In addition to the stocks for citrus already enumerated, recent investigations have shown that the Saramacca citron, a sour orange, is suitable for pomeloes, grape fruit, and lemon. Experiments are in hand to obtain a satisfactory stock for imported grape fruit varieties. The following stocks are under trial —sour orange, Bigaradier orange, sweet lime, Japanese citron, rough lemon, sweet orange.

Pomelo in Bearing
Pomelo Delima on Japanese citron stock, seven years old.



Citrus Propagating Beds
Cuttings of Rough Lemon, five months old, as stocks. Showing cambric covered shelters.

Budded Grape Fruit Showing Frame
Manis besar on sweet lime stock.

Lemon in Bearing
Ponderosa Lemon on Sour Orange Stock, four years old.

Diseases and Pests.

Several diseases cause severe damage in the citrus orchards. Gum disease, *Phytophthora parasitica,* attacks the bark at ground level and may cause the death of the tree. Treatment consists of excising the diseased bark, after which the wound is smeared with a mixture of paraffin wax and carbolineum, in the proportion of 92 to 8. The sweet orange is particularly liable to this disease in Java. Recent investigations have proved that inarching seedlings of rough lemons or Japanese citron at the base of severely diseased trees saves many affected trees*. Diplodia gum disease, *Diplodia natalensis,* attacks the bark of the trunk and the main branches. The treatment is similar to that outlined above. Canker, *Pseudomonas Citri,* and scab, *Sphaceloma fawcettii,* attack the leaves, young growth, and fruits of most citrus and cause a corky excrescence. The infection takes place when the leaves and fruits are young. Both diseases may be effectively controlled by fortnightly spraying with Bordeaux mixture shortly before the young leaves appear and after the fruits have formed. A dry Diplodia (*Diplodia sp.*) attacks the smaller branches. It can be controlled in the early stages by spraying with Bordeaux mixture.

Insects pests are numerous. Mites, which damage the leaves and fruit, are kept in check by sulphur dusting. The larvae of a fruit fly and Citrus moth, *Citripestis sagatiferella,* frequently cause great damage to pomeloes and grape fruit. The only practical method to be employed in combatting these pests is to enclose individual fruits in paper or cambric bags, four weeks after setting. Several scale insects are troublesome and, unless attended to, may render the fruit unsaleable. Scales are kept in check by fortnightly spraying with kerosine and soap emulsion. Ants are responsible for the presence of certain scales, and the former are excluded from the trees by attaching a band of wire gauze covered with glue to the base of the tree. Mealy bugs and aphis are controlled by spraying with kerosine and soap, or 2 per cent. alcohol and soap emulsions.

Particular mention is made of the more important diseases and pests occurring at Ragoenan, since, without adequate control measures, the cultivation of citrus would undoubtedly be a complete failure.

Field Cultivation.

Planting is undertaken during the rainy season, when the soil is in a moist condition and the young fruit trees are not liable to receive any check. Most trees are planted with a stem about 2½ feet high. Citrus are usually cut back and four strong shoots allowed to grow. From planting to maturity constant attention to the growing trees is necessary. This is specially so in the case of citrus, which are very liable to serious disease and insect attack at all stages of growth. The land may be under leguminous crops or grass, but a wide circle round each tree should be cultivated and kept free from weeds. At Ragoenan Experiment Station, artificial irrigation is provided throughout all planted areas wherever practicable. It is not possible, without further experience, to say

* Root Renewal of Citrus Trees with Gum Disease, *Landbouw,* VII, No. 5, p. 372.

whether irrigation is necessary under conditions in Malaya. Pruning is an important consideration, especially during the early stages of growth. The main object is to provide a suitable frame of strong main and lateral branches. Citrus trees, which are cut back severely before planting, tend to form a good head naturally. Certain fruit trees, such as the rambutan and pulasan, may be induced to form new growth for the next season's crop, by light pruning of the outer branches after the crop has been harvested.

Manuring.

Under the conditions obtaining at Ragoenan Experiment Station, heavy manuring is found necessary to secure adequate growth and yields from all varieties of fruit trees cultivated. Three large-scale field experiments are in hand. An area of 14 acres with Rambutan Seematjan on Seematjan stocks, planted in December, 1930, provides 504 trees under fourteen separate manurial treatments, including control plots. There are six trees in each plot with six replications randomised throughout the area. The trees commenced to flower in September, 1933, and the first crop of fruit was gathered in January, 1934. The trees in the plots receiving cattle manure or cattle manure together with artificial fertilizers, were more advanced and yielded a heavier crop than trees receiving artificial fertilizers alone, or in conjunction with legume and/or lime incorporated in the soil. A similar manurial experiment was commenced with an area containing 618 pomelo trees planted in 1932, and grape fruit trees planted in October, 1933. Cattle manure is dug into shallow trenches on the outer perimeter of the trees, whilst artificial fertilizers are spread beneath the trees and lightly covered with soil. The following treatment is commonly practised with young fruit trees at Ragoenan and serves as a guide to the manurial programme considered necessary.

Manuring of Young Fruit Trees.

Year.	Treatment per tree.	Remarks.
1	50 lbs. cattle manure	At planting.
2	100 lbs. „ „	
3	150 lbs. „ „	
4	2 lbs. sulphate of ammonia 4 lbs. basic slag 2 lbs. sulphate of potash	Trees in bearing.
5	-do- -do-	
6	-do- -do-	plus 100 lbs. cattle manure.
7	As 4th. year.	

Future treatment depends upon the appearance of the trees. Citrus trees in full bearing require heavy manuring with additional quantities of potash.

Yields.

The majority of budded fruit trees commence to bear during the third or fourth year from planting. The durian, duku and Jack fruit, bear fruit when about six years old. As already stated, the staff of the Bureau of Horticulture collects data annually regarding yields from the major fruits cultivated in a number of districts throughout Java. In the following table the average yields of fruit per tree, from fifty trees of different ages in Pasar Minggoe district for a varying number of years are recorded. The average maximum yield for the same period is given for comparison. Present prices, which the growers receive, are appended —

Yield of Fruit in Kampongs at Pasar Minggoe.

Fruit.		Average yield per tree.	Average maximum yield per tree.	Number of years.	Prices 1934 Guilder cents.
Mango local	...	482	2,600	3	1
Soursop	...	27	96	3	3-4
Bullock's Heart	...	78	413	3	—
Durian	...	72	252	5	5
Duku	...	782	5,220	5	—
Jack Fruit	...	10	71	5	50
Chempedak	...	62	331	5	15
Rose Apple	...	353	2,057	4	1
Guava	...	359	2,902	3	25 cts. per 100
Bilimbing	...	262	1,038	4	60 ,, ,,
Lime	...	385	2,000	4	10 ,, ,,
Lemon	...	90	500	4	50 ,, ,,
Pomelo :					
Pandanwangi	...	203	678	8	4
Delima	...	154	478	8	6
Mandarin Orange	...	667	3,423	4	25 cts. p. 100
Rambutan : Seematjan	...	126(x)	474(x)	9	G. 2. 25 per 100 bunches.
Lebakboeloes	...	156(x)	549(x)	9	,,
Manis	...	127(o)	471(o)	9	..
Chiku	...	1,373	4,392	7	6 cts. p. 100

(x) In bunches of 15 fruits.

(o) In bunches of 25 fruits.

The prices which growers receive are now at a very low level.

Records of yields of various fruit trees at Ragoenan Experiment Station, collected during 1933—34 are as follows:—

Yields of Fruit at Ragoenan.

Fruit.	Average fruits per tree.	Remarks.
Sweet Orange:		
Norris	334	7 year old budded trees.
Manis	349	-do-
Valencia Late	166	5 year old trees on rough lemon stock.
,,	262	8 year old trees on rough lemon stock.
Sweet Orange:		
Manis	264	6 year old trees on rough lemon stock.
,,	180	6 -do- -do-
,,	436	6 year old trees on own rootstock.
Mandarin Orange:		
Satsuma	160	6 year old trees.
Siam	146	4 year old trees on Japanese citron stock.
,,	150	4 year old trees on rough lemon stock.
King	147	On Japanese citron stock.
Pumelo Bali	128	7 year old trees on sweet orange stock.
,,	141	7 year old trees on rough lemon stock.
,,	128	7 year old trees on Japanese citron stock.
,,	108	5 year old trees on sour orange stock.
,,	170	7 year old trees on pumelo stock.
Rambutan:		
Seematjan	2,400	8 year old budded trees.
Lebakboeloes	1,460	6 year old budded trees.

Acknowledgments.

The writer is grateful to the Head of the Agriculture and Fishery Service, Java, for kind permission to visit the Ragoenan Experiment Station. Mr. J. J. Ochse, Chief of the Bureau of Horticulture, Batavia, and Mr. M. M. Magielse, Manager of the Experiment Station, Pasar Minggoe, afforded every facility in conducting the investigations and spared no pains in giving all necessary information. The writer desires to record his sincere thanks to these two officers.

NOTE ON THE VALUATION OF SOME NATURAL PHOSPHATES

BY
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A series of experiments with some naturally-occurring phosphates has been carried out recently in which attempts have been made to correlate the phosphate contents of the materials, as determined by their solubilities in various reagents, with the results of pot experiments, using maize as the indicator crop.

The phosphates used in the experiments comprised two samples of Perlis phosphate*, one sample of Gafsa rock phosphate and one sample of Cheribon rock phosphate.

As regards the analytical work, determinations were made of (*a*) degree of fineness of grinding using a 100-mesh sieve, (*b*) total amount of phosphate, (*c*) amount of phosphate soluble in 1 per cent. citric acid and (*d*) amount of phosphate soluble in 6 per cent. acetic acid. Acetic acid was employed to eliminate possible solution of iron and aluminum phosphate.

The methods employed for the determinations of the total and the citric acid soluble phosphates followed those laid down in the Official Methods of Analysis prescribed by the British Fertilisers and Feeding Stuffs Act. In the case of acetic acid, treatment consisted in boiling one gramme of the material with 100 c.c. of 6 per cent. acetic acid for one hour under a reflux condenser. The liquid was filtered and the phosphoric acid in the filtrate determined by the appropriate method.

Table I.

Details of Fineness of Grinding and Phosphate Contents with Various Reagents.

Details of Fertiliser.	Proportion of Material passing 100-mesh sieve.	Total Phosphate. as P_2O_5	Citric Acid Soluble Phosphate. as P_2O_5	Acetic Acid Soluble Phosphate. as P_2O_5
	per cent.	per cent.	per cent.	per cent.
Perlis No. 1 ...	68	6.9	1.3	1.5
Perlis No. 2 ...	82	20.6	16.5	8.0
Gafsa Phosphate ...	94	29.3	12.5	5.4
Cheribon Phosphate ...	76	29.6	12.9	6.0

* These local phosphates are usually known as guanos. They contain, however, negligible quantities of nitrogen.

The results of analysis are shown in Table I. In order to make the results comparable, all the figures have been calculated on a moisture-free basis.

The results of analysis indicate that, although the second sample of Perlis phosphate has a lower phosphate content than either the Gafsa or the Cheribon material, a higher proportion is soluble both in citric acid and acetic acid.

In the pot trials, the quantity of phosphate was adjusted so that the total amount present was equivalent to 30 lbs. of total P_2O_5 per acre. In order that the plants should not suffer from deficiency of nitrogen or potash, calcium cyanamide was added at the rate of 168 lbs. per acre and potassium sulphate at the rate of 56 lbs. per acre.

The differences in growth were striking and were obviously not in accordance with the total amounts of P_2O_5 present as will be seen from the accompanying photographs (See Plate I).

With such a trial, it is not possible to say whether growth was more in accord with the citric soluble or the acetic soluble phosphate. In the case of the citric soluble portion, Perlis No. 2 has more than 12 times the amount of Perlis No. 1, while the ratio is about 5 : 6 in the case of the acetic acid soluble phosphate.

Two broad conclusions can, however, be drawn :—

(i) It is useless to buy local guanos without some knowledge of the phosphate content.

(ii) The total phosphate is not a criterion of the value of such fertilisers.

Intending purchasers are, therefore, advised in all cases to obtain an approximate analysis of the material giving quantity of phosphate soluble in dilute acid.

Further, in view of the wide variation in composition shown by the two samples of Perlis phosphate, care should be taken to ensure that the sample submitted for analysis is representative of the consignment. This is especially necessary when the fertiliser is to be applied to quick-growing annual crops.

Ca. Cyanamide & Pot. Sulphate
PERLIS
PERLIS II

Ca. Cyanamide & Pot. Sulphate
CHERIBON
GAFSA

AGRICULTURAL PROGRESS IN LABUAN AND BRUNEI*

BY

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Agricultural Field Officer, Singapore.

Part I - Brunei.

A visit to Brunei was timed to coincide with the padi harvest, but the season being somewhat earlier than usual, harvesting had finished in most districts by the middle of March. The main objects of this visit were the inspection and further development of work in progress at the Brunei Agricultural Station at Kilanas, the supervision of the harvesting of the padi experiments laid down last August, and furtherance of the general programme of agricultural expansion within the State.

Progress at the Agricultural Station, Kilanas.

Substantial progress with the establishment of this main Station has been made in the past seven months. As is inevitable in the opening of land in a district which, with the exception of one area under wet padi cultivation, is almost entirely under jungle, and which is very thinly populated, pests such as wild pigs, rats, birds, and insects have proved extremely troublesome. Early action was taken, however, to combat these pests and the appearance of the crops indicates the effectiveness of the necessary prevention and control measures taken.

The soil at this Station consists of sedimentary deposits of great thickness, is of a heavy clay nature and difficult to drain or cultivate. It is however, typical of Brunei.

A series of open drains has been dug, but these have not proved adequate and a revised layout has therefore been prepared. An experiment on liming the soil has been initiated.

A large number of different plants have been established at the Station, including well-known fruits, cover and forage crops, and miscellaneous crops of economic importance, most of which are being grown with the object of investigating the growth of crops suitable for cultivation by small-holders under local conditions.

Padi Experiments.

The first series of padi experiments was designed to compare the yields of pure strains of padi from Krian with the locally-grown varieties, and to observe the suitability of the former under local conditions. Insect pests proved troublesome and have affected the results. Although the results from this initial season are inconclusive, Seraup 15 and Siam 76 of the imported

* The following is abridged from Reports submitted by the writer on his visit to Labuan and Brunei between 2nd March and 3rd April, 1934.

strains, seem most suited, yields per acre being 383 and 324 gantangs per acre respectively, while a local variety, Sibakit, gave the third highest yield of 323 gantangs per acre.

Padi Test Plots have been opened at Kilanas and Lumapas where a number of local strains of padi have been planted for a preliminary study of type and yield with a view to selection work. From the crop obtained, selections were made for planting at a Station in Malaya.

Great interest is evinced amongst native cultivators in the work in hand. The Kilanas Station has now become a general meeting place for Kedayan cultivators, where matters relating to agriculture in general and padi planting in particular are discussed. Moreover, the area surrounding the Station is being opened up for more wet padi cultivation. A considerable extension of this area is anticipated in the coming season.

It is also reported that a demand for fruit tree planting material is beginning to arise in the Kilanas neighbourhood and that intending cultivators look to the Station as the natural source of this material.

Government Rice Mill.

The Government Rice Mill, which was installed in Brunei town in 1933, ran very successfully during its first season and produced a high percentage of rice of good quality. The support forthcoming from the natives was very satisfactory and there is no doubt that the mill serves a useful purpose and is likely to become of increasing value.

Sago Mill.

A proposal is under consideration by a Chinese to establish a sago mill on the Belait River. The proposal is sound provided some guarantee can be afforded to the factory owner that supplies of sago will be regular. Sago is at present manufactured by the usual native methods.

General.

Coffee. At the Government Experimental Plot at Brakas an excellent stand of seedlings both in pots and in beds has been established from imported seed. Some of the bushes have commenced bearing, but a number shew signs of suffering from excess water. Temporary improvement of drainage can be effected, but satisfactory drainage of the Plot will only be attained when the adjoining Brakas Padi Test Plot is in regular use.

Staff. Two Brunei Malay officers have returned on the conclusion of a course of training at the School of Agriculture, Malaya. Arrangements have been made for the distribution of the work between these two officers.

Part II - Labuan.

Plans have been drawn up and the preliminary work of clearing an area put in hand for the establishment of an agricultural station. A Malay officer

will shortly be put in charge of this work on his return from a course of agricultural training in Malaya.

Progress of agricultural development in Labuan is rather held up for lack of a Malay officer to organise the work. An abortive attempt was made in 1932 to form an agricultural society; it has now been decided to await the arrival of the Malay officer before re-considering the possibility of organising the local small-holders into a society.

The presence of an officer is also required for crop pest and disease control.

Enquiry has been made regarding the poultry industry in Labuan. Further efforts are to be made to investigate the possibility of marketing produce, but it is realised that, on account of inaccessibility, this problem presents many difficulties.

Agricultural progress in Labuan has been extremely slow and the Resident, who fully realises the desirability of improving conditions, has experienced many disappointments. It is felt, however, that with the establishment of the Agricultural Station and the arrival of a trained Malay subordinate, definite progress will be possible.

Miscellaneous Article

THE ALL-MALAYAN PADI COMPETITION.

The first All-Malayan Padi Competition came to a satisfactory conclusion with the final stage, or Central Competition, which was held in conjunction with the recent Eleventh Malayan Exhibition.

The reasons leading up to the inauguration of this competition together with the rules governing it, have already formed the basis of an article in this Journal*, and it is here only necessary briefly to recapitulate the salient points.

The competition is divided into two parts : the local or district competitions and the Central Competition at the Annual Exhibition of the Malayan Agri-Horticultural Association in Kuala Lumpur.

Exhibits, consisting of three gantangs (Imperial gallons) of padi, must be of a strain approved for entry in the Competition, and must bear a statement giving the locality of the holding and size of the area from which the padi was drawn, together with a certificate of yield.

Only the three best exhibits from each local competition are admitted to the Central Competition which, consequently, should comprise the best padi in Malaya.

The general response to the competition was extremely satisfactory and encouraging, the scheme being taken up with considerable enthusiasm in the districts throughout the Federated Malay States and the Settlements of Penang and Malacca. As evidence of this it may be recorded that in Negri Sembilan, thirty-five local shows were held. With such a large number of minor competitions, further selection was necessary and actually some fifty exhibits were entered for the Central Competition.

A report on these local competitions in Negri Sembilan, shows that they have attracted considerable attention and that in some centres, more particularly in the District of Kuala Pilah, the quantity and quality of the samples submitted were of a satisfactory order and competition was keen.

The report points out, however, that the general appearance of the padi bore unmistakable evidence of a wet harvest which was reflected in the presence of immature and undeveloped, and also in many cases, mouldy grain. The almost universal presence of grain moth and weevil was also an indication of insufficient drying prior to storage. It is anticipated that the changes in planting dates arranged in most districts for the forthcoming season, will result in heavier yields and sounder grain.

In Perak, a proposal to hold a State Agricultural Show in Kuala Kangsar on May 10th, the birthday of H.H. The Sultan of Perak, made it possible to give particular prominence to the competition. Twelve local shows were held and care was taken that the number of such shows in each District should be in approximate proportion to the area of padi grown.

The three prize-winning exhibits from each local show were sent to the State Show, and were also eventually entered in the Central Competition, in

* *Malayan Agricultural Journal*, Vol. XXI No. 12, December 1933.

accordance with the rules. The State Show thus served as a supplement to the Central Competition and did much to stimulate local interest.

Some 160 exhibits were received for the Central Competition and were suitably displayed at the Eleventh Malayan Exhibition. Preliminary judging on the day before the Exhibition reduced the number of possible winners to forty, from which twelve were selected for final consideration after prolonged and careful judging.

The exhibits reached a particularly high standard of quality which can be gauged by the fact that the judges were occupied for four hours in dealing with the selected forty exhibits, the final twelve being subjected to further very careful scrutiny and tests before the six awards were made.

Judging was carried out on a basis of 100 marks, allotted as follows :—

1.	Purity of sample	30
2.	Type of grain	20
3.	Condition and uniformity of ripeness ...	20
4.	Condition and uniformity of grains ...	10
5.	Weight per volume	10
6.	Cleanliness	10
		100

Purity of sample is most important as it denotes understanding and care in the selection of seed. An unduly impure sample is eliminated immediately. Items 2 and 3 also apply to preliminary judging more particularly, condition and uniformity of ripeness being an important point as indicating whether the padi ripens evenly and quickly and thus can be harvested rapidly.

The first prize was won by a sample of a high-yielding variety of padi, known locally as "Mayang Sa-Batil", from Balik Pulau, Penang. The grain of this variety is broad, plump and of medium length, with a moderately thin, white husk. The sample was remarkably free from blemishes, even, in size and ripeness and of high density.

This strain of padi is well established in Penang Island. Part of the sample is being used by the Department of Agriculture for planting at the local Padi Test Station during the present season in order to produce material for pure line selection.

The second prize was awarded to a sample of the high-yielding pedigree strain Siam 29 from Malacca. This is a locally selected strain of a variety very popular and widely grown in Malacca. It is a padi maturing in about six months, having a long, somewhat slender, cylindrical grain with a thin, white husk. It has a good flavour and is of good type for milling.

The third prize was awarded to a sample of the well-known Radin variety from the Kuala Kangsar District of Perak. This was almost certainly derived from the pedigree strain Radin 4 which has a slightly humped, fairly broad

grain of medium length, with a reddish brown husk. Radin 4 is a strain of padi maturing in about 7 months and giving a high yield of grain.

The fourth prize was won by a sample of Radin from the Raub District of Pahang, while two samples of Serendah Kuning from the Kuala Pilah District of Negri Sembilan won the fifth and sixth prizes. This latter variety is very popular in the District, but has not yet been subjected to pure line selection. The grain of the prize-winning samples was, however, fairly even in size, uniform in type and of good quality.

It is noteworthy that awards were fairly evenly divided amongst the competing States, thus implying general excellence of the padi entered for competition.

A further point of interest is that one outcome of the Competition has been to encourage the holding of District Agricultural Shows in conjunction with the district padi competition. Thus, Agricultural Shows for various kinds of agricultural products and local handicrafts were held at Balik Pulau, Bukit Mertajam, Telok Anson and Temerloh in the six weeks immediately preceding the Malayan Exhibition.

Although there were on this occasion no exhibits from any of the Unfederated States, the inability of these States to participate was due, in part at least, to the comparatively short period available for organising the competition. Arrangements, which include the distribution of some 4000 gantangs of seed of pedigree strains of padi selected at the Telok Chengai Station from popular local varieties, have already been made for the participation of the State of Kedah in next year's Malayan Competition. It is hoped that certain of the other Unfederated States may also be able to send exhibits next year.

In conclusion, it can fairly be claimed that the competition was an unqualified success and achieved its objects, in that it has stimulated interest throughout Malaya in padi planting and has ensured that the prize-winning exhibits at the Malayan Exhibition definitely represent the best padi in Malaya.

Abstract.

PRUNING OF TEA IN RELATION TO ESTATE PROFITS*.

It has always been realised that it is possible to reduce the yield and capital value of tea bushes by gross errors in pruning, but what is not realised is that the value of the methods in every-day use vary to an extraordinary extent according to the elevation of the estate and the climate it enjoys.

Dr. Gadd at the Tea Conference of 1929 showed that, in his experience, a deficiency of starch in the roots was the predisposing cause of death after pruning, and that the fungus *Botryodiplodia Theobromae* was of minor importance, merely playing a secondary part in attacking bushes already dying from physiological causes. One line of Mr. Tubb's work at Galatura and in the laboratory at St. Coombs has been the confirmation of his work and its extension to include dieback and the investigation of its effect on yield and growth.

He collected sixty-nine samples of roots from tea of approximately eighteen months after pruning from all over the tea districts. An examination of the total carbohydrates extractible by a standard acid extraction showed that the percentage of carbohydrates in the roots varied according to the elevation of the field of tea, and that when plotted against elevation the points tended to fall on to a straight line. This line, when statistically calculated, showed that, on the average, the percentage of carbohydrates rose from 10.13 per cent. at sea level by 0.232 per hundred feet to 26.37 per cent. at an elevation of 7,000 feet. In other words, the highest tea in the Island has more than two and a half times as much carbohydrates in the roots as the lowest. By no means all the carbohydrates extracted by the acid treatment used are available for use in recovery after pruning. Bushes that have died after pruning commonly contain about twelve per cent. Thus, unless the bushes at pruning time contain a balance over this amount when pruned, the food is not available to enable new shoots to be produced, and death, partial or complete, must follow.

The probable fundamental cause of this difference in the size of the carbohydrate balance at different elevations is temperature. Temperature falls by approximately three and a half degrees Fahrenheit for every thousand feet of higher elevation. The higher the temperature, the greater the rate of photosynthesis, growth, and respiration of a plant. Photosynthesis is the process of carbohydrate manufacture, and the higher temperatures of the Low-country will speed up the process during the hours of the day in which light is available for the process. But the breakdown of carbohydrates by respiration is also speeded up—and this proceeds throughout the twenty-four hours, instead of for only about twelve hours a day. In addition, the enhanced growth rate calls for more carbohydrates to be used directly in building up leaves, stems, and roots instead of being stored up as reserves.

* Abstract of a lecture given before the Sabaragamuwa District Planters' Association, by F. R. Tubbs of the Tea Research Institute of Ceylon and published in *The Tea Quarterly*, Vol. VII, Part I, February 1934.

Thus, as a result of climatic differences, the bush at a high elevation contains within its roots ample reserves to enable its recovery from pruning, while those at low elevations do not.

Manuring and cultivation have sometimes been suggested as remedies. Manures have their very distinct place in the scheme of maintaining the health of the bush, but what is wanted in the Low-country at pruning time is carbohydrates within the bush. Leaves are the organs for manufacture of these substances and it follows that, if the bush has not sufficient carbohydrates stored up by the end of its cycle to enable full and healthy recovery from pruning, it must not be deprived of its sole source of fresh supplies.

Leaves must be left on the bush at pruning time in such cases. Mr. Tubbs states that he would adopt this procedure at any elevation below 1,500 feet above sea level. Any form of cut-across gives the desired result, but this method suffers from two disadvantages. Firstly, often insufficient leaves are left, and secondly, any dead or diseased wood cannot be efficiently cleaned out. Lung pruning allows of sufficient leaves being left on, and also for efficient and careful cleaning out of the interior of the bush at pruning.

The number of leaves which should remain on the bush depends upon the reserves the bush already possesses. At the lowest elevations well over three hundred leaves should be left. It is not accurate enough to say three or six lungs should be left, for their value depends upon the area of leaf surface upon them. But a count of the leaves left on a few bushes soon gives one an idea of the number remaining which proves a better estimate of leaf areas. At higher elevations progressively fewer leaves will be needed.

Beneficial results from lung pruning can be proved. Taking first the question of the yield of flush from rim lung and clean pruned plots. The cycle of two years of the Galatura experiment will not be complete until the end of April, but it is obvious from the yields to date that pruning in such a way as to leave about two hundred leaves per bush on the lungs till about ten days before tipping has resulted in an increase of crop of over 200 pounds per acre to date. This more than compensates for the extra two or perhaps three rupees an acre required for pruning.

These results on yield are not of prime importance at the moment owing to restriction, but they will be definitely important when restriction ends. The fact that these results were obtained in the first cycle is stressed. It is reasonable to expect that there will be cumulative effects and, if these are of any magnitude, even more striking results may be expected in the future. The continuation of the experiments will decide the point.

There is no evidence to date of any loss of quality due to this enhanced yield, and as the difference in yield appears to be due at least in part to dieback, there is no rational reason for expecting it.

The yield of a tea estate affects both the total revenue coming in and also the cost per pound of putting the tea on the market. But the profit available for distribution is always reduced by the amount of the expenditure required

to maintain the estate in good order as a commercial proposition. It stands to reason, therefore, that if one can, to some extent, reduce the wear-and-tear on the bushes—a smaller proportion of the gross profits will be absorbed in replacement and in restoring the bushes to good health. It is essential, therefore, to consider not merely the effect of pruning on yield, but also its effect on the maintenance of the capital value of the plant.

In 1932 there were published in *The Tea Quarterly* figures concerning the effect of the method of pruning on the number of deaths after pruning and the amount of dieback in the Low-country. Perhaps owing to the impression that variations in pruning had little effect on yield or profits, the article caused little comment in planting circles. It was shown that the number of deaths per acre, reckoning 3,000 bushes to the acre, was one hundred and thirty-four in the clean pruned plots and only sixteen in the rim lung pruned plots. These figures are sufficiently startling, but in addition there is now data from an experiment at Galatura performed in 1933. In this experiment were observed the effects of (*a*) 6 lungs left of the bush either one or two months after pruning, (*b*) 3 lungs left on the bush for either one or two months after pruning and (*c*) clean pruning. Six lungs carried an average of 327 leaves, three lungs 203, while clean pruning left an average of 3 leaves.

It was found that the six lung treatment resulted in only 22.5 deaths, compared with 28.2 for three lungs and 168.6 for clean pruning per acre of 3,000 bushes. In other words, 327 leaves remaining on the bush for part of the recovery period resulted in decreasing the number of deaths by eighty-seven per cent.

This, as is obvious, has a considerable bearing on estate profits. If replacement of a bearing tea bush costs fifty cents per bush, the 1932 experiment showed a saving of Rs. 59 per acre and the 1933 experiment a saving of Rs. 74 per acre in capital value.

The effect of method of pruning on the health of the bushes that survive has also to be considered. After pruning, the bush may not die completely—it may suffer death of some of its frame branches only. This reduces yield, and provides entrances to disease organisms which bring in their train a whole series of losses. Measurements to date have shown that up to twelve hundred pounds of dead wood per acre may be removed after pruning and even this high figure is sometimes considerably exceeded over small areas. The amount of pre-tipping dieback can be reduced considerably by lung pruning. The figures obtained per thousand bushes were

Clean prune	...	...	236.9 pounds.
3 lungs	...	...	127.3 „
6 lungs	...	...	109.5 „

The method of pruning does not appear to affect the amount of post-tipping dieback, however.

These figures, as might be expected, are reflected in the recovery after pruning. The dry weight of material removed in tipping provides an index of recovery. The weight of tippings from the six lung treatments is more than double that from clean pruning, with the three lung treatment occupying an intermediate position.

It is interesting to note that there is significant evidence that if only about two hundred leaves per bush are left on the lungs, they should be left on for at least two months, whereas with three hundred leaves per bush the lungs can be removed earlier without disadvantage. Figures also effectually contradict the fear that is sometimes expressed that the growth of the lungs is prejudicial to the production of tipping shoots in the centre of the bush.

To sum up, one may, by providing plenty of leaves on the bush during the period immediately following on the pruning operation, reduce the number of deaths and the amount of dieback and increase the rate of recovery and subsequently the yield of the tea by amounts which are sufficiently great to be of considerable importance.

Reviews.

Egg Weight in the Domestic Fowl.

E. M. Funk and H. L. Kempster. Agr. Exp. Stat. Bull. 332, Univ. Missouri Coll. of Agr. Columbia, Missouri, Feb. 1934. 15 pp.

With the growing tendency towards the buying of eggs on a graded basis, the demand for information on egg grades has increased. This Bulletin recounts the investigations on this subject at the Missouri College of Agriculture, and although climatic conditions are dissimilar to those obtaining in Malaya, the conclusions are of value and should serve as a basis of similar enquiry in this country.

The authors find that the weight of eggs laid by pullets during their first few months of production is very definitely related to the month in which sexual maturity occurs. Maximum egg weight was reached during February by pullets which began laying in any of the months from September to February. In other words, maximum weight of egg was obtained during the natural breeding season. It is doubtful whether in Malaya, with its equable climate, a similar relationship could be found, or if found, whether it would be so marked.

The age at which the pullet began to lay influenced the weight of eggs laid. Calculations made to eliminate the influence of body weight shewed that the age at sexual maturity significantly influences egg weight. Egg weight is also influenced by body weight.

Egg weight increases from the first egg to the next few eggs laid, the increase gradually diminishing until the mean egg weight is reached by the time the thirtieth egg is laid.

Eggs produced in the morning are very definitely larger than those laid during the afternoon. This relationship is attributed to the fact that the first eggs laid in a given clutch are larger and are produced in the morning.

The authors show that eggs of maximum weight are produced in the spring months, while smaller eggs are laid during the summer months. They refer to the work of Dr. D. C. Warren of the Kansas State Agricultural College who has shewn that high temperatures cause birds to produce smaller eggs. It is uncertain from the authors' investigations, whether their results in this respect are due to the breeding season factor or to temperature. This question of temperature is one of great importance in Malaya. The results indicate the great value of providing cool quarters for the birds and adequate shade.

The position of the egg in the clutch (group of eggs laid in consecutive days) influences the weight of eggs. The following facts emerge from a study of this factor. The first egg of a clutch is usually the largest laid in that clutch; but if the first egg laid in a clutch followed a rest period of 7 days or longer, it was usually smaller than the other eggs in that clutch. It was also observed

that the decrease in weight per egg was greatest in the shorter clutches and that the total decrease from first to last egg was not materially greater in the longer clutches.

Furthermore, if the first egg in a clutch was a large egg, the decrease in weight of succeeding eggs was much greater than if the first egg laid was a small egg.

The decrease of egg weight within a clutch was greatest during the spring months and least during the colder months.

The largest eggs produced at the Station were those laid by Rhode Island Reds. Within a breed, however, there is a wide variation in the weight of egg produced. These differences may be established by breeding and become strain differences. Large egg size is not confined to any one breed, but can be bred into any of the common breeds.

Egg weight is an inheritable factor. Results of investigations with White Plymouth Rocks shewed that dams which lay large eggs tend to produce daughters which also produce large eggs; similarly, dams which lay small eggs tend to produce daughters with the same character. Egg weight is no doubt also inherited from the male.

Egg weight may be influenced by the ration. It has been shewn that birds receiving milk laid larger eggs than did those receiving meat scrap, tankage, soyabean meal, cottonseed meal, or ground soyabeans. The use of mineral supplements—such as oyster shell, or ground limestone—increases egg weight. Since body weight is related to egg weight, the maintenance of body weight by proper feeding methods would no doubt be helpful in maintaining egg weight. The maintenance of body weight is also essential for high egg production. Stimulation of egg production by the use of artificial lights has not affected egg weight.

In reviewing this work in the light of poultry keeping in tropical regions, two important points emerge; the provision of a well-balanced ration and adequate housing. Seasonal differences there probably are, but local investigation on the lines described by the authors is necessary to identify them. They are important, however, especially to enable the poultry-keeper to estimate how far egg production and size of egg are influenced by factors over which he has no control and how far they are capable of adjustment by the exercise of his care in breeding, housing and feeding.

D. H. G.

Farm Poultry Production.

L. E. Card and M. H. Henderson. 202 pp. 1933. Illustrated.
Obtainable from Messrs. N. K. Paul & Sons, Post Box No. 12202. Calcutta.
Price Rs. 17.8.0 plus postage.

The object of this text book is to afford a working knowledge of the principles underlying practical poultry keeping, as applied in those sections of the United States where poultry is an important part of the farm business, but where specialised poultry farming is rather uncommon. The treatment is thus biased in favour of the keeper of the smaller-sized flocks.

The book is divided into eight chapters as follows—The Business of Poultry Keeping, Judging Fowls for Egg Production, Feeding, Housing, Maintenance, Hatching and Rearing, Marketing, and Breeding. In these, the subject matter is presented in a very readable manner, and the whole book is admirable on account of its directness, simple language and good definitions. The theory underlying feeding and breeding is simply, yet adequately explained, and the intelligent student of poultry keeping and the beginner should have but few difficulties with the text.

Naturally, due to the very different climatic and economic environment for which it was written, a certain proportion of the information incorporated is not capable of direct local application. This applies particularly to the details of rations and housing construction, and to the chapter on the marketing of poultry produce. In all the chapters, however, the underlying general principles are explained in such a manner that they can readily be interpreted and applied in terms of local conditions. Similarly, most chapters are noteworthy for their content of information on practical matters which very often puzzle the beginner, *e.g.* how to handle and cull.

The book is essentially one for the student and amateur poultry keeper, and not for the expert, but it should also prove of considerable value to the teacher of poultry husbandry in aiding to draw up a course of lectures and practical work suitable to local conditions.

V. C. D.

Departmental.

FROM THE DISTRICTS.

June, 1934.

Compiled by the Chief Field Officer from Monthly Reports submitted by Field Officers.

The Weather.

The rainfall in the inland area on the west of the Peninsula from South Kedah to the Negri Sembilan border, in Krian District, in the Districts of Bentong and Temerloh in Pahang, and in the Johore Bahru and Kota Tinggi Districts of Johore was above average for the month of June, and was about double the average in the central portion of the Peninsula close under the western side of the main range, while at Cameron Highlands it was as much as three times greater than the previous average for the month. In North Kedah, however, and on much of the western coast, as well as on the east coast of Kelantan and Pahang, it was below average to a varying extent, as for example in the Muar District of Johore, where the drought of the previous two months continued. Elsewhere rainfall was normal, except in Singapore Island where sudden and somewhat severe storms during an otherwise hot dry month produced a rainfall well above the average. In much of the country, conditions became dryer during the last week of the month.

Remarks on Crops.

Rubber.—During the first month of the restriction scheme prices have been steadier than those obtaining during May. The lowest and highest prices in dollars and cents per picul for rubber from small holdings were: Smoked Sheet $18 to $27; Unsmoked Sheet $15 to $25, prices below $18 being exceptional. Corresponding prices for May were $16 to $34 and $12 to $31.50. The Singapore price for Smoked Sheet was $26, while the Penang price for Unsmoked Sheet ranged from $22 to $23.50 per picul as compared with $24 to $31.50 in May. Although the Singapore price for scrap rubber was $11 and the price range in Kedah and Province Wellesley was $10 to $15 per picul, there was no demand for this grade in the greater part of the Peninsula and in the few localities where sales were effected, prices varied from $2 to $9 per picul.

Production for the month from small holdings was limited to the quota enforced by the operation of the restriction scheme, but is likely to have been further curtailed in some areas by the effect of wet weather in preventing tapping and by the fact that it was not possible to complete the issue of coupons in all Districts.

Conditions of upkeep on small holdings continued to improve. Weather conditions favoured the incidence of bark diseases, but the use of satisfactory measures of control continued to become more general. It was recorded in Province Wellesley and Singapore Island that infected trees were often left untapped, because the quotas permitted by the export coupons could be obtained by tapping only the healthy trees.

Padi.—The price of padi at the Government Rice Mill, Bagan Serai, was reduced to $1.25 per picul towards the end of the month. In Kedah there was a further slight rise in the price which was equivalent to $1.10 to $1.17 per picul in Kota Star District, while in Province Wellesley the range was $1.10 to $1.50 per picul. Elsewhere there was little change, the quotations varying from 5 to 12 cents per gantang.

Preparation of the land and the planting of nurseries was commenced in accordance with the prescribed programmes in several parts of the country, of which the more important were the north and central portions of Kedah and Province Wellesley and the north western area of Krian District.

In Kedah over 4,000 gantangs of seed of certain high-yielding pure strains of padi were distributed, either in exchange for an equal quantity of unselected seed or by sale at 5 cents per gantang; such distribution forms part of the programme for the Padi Competition to be held in that State at the close of the present season.

Coconuts.—There was a further slight improvement in the average price of copra, the range in different localities being $1.10 to $3 per picul. The Singapore price was about $2.50 as compared with $2.40 per picul in May.

The first sale of copra prepared on the new Government-aided kiln at Sri Menanti in the Muar District of Johore realised an average price of $2.98 per picul f.o.b. Muar. This price was 50 cents per picul higher than the local figure and was considered very satisfactory.

Increase in the internal trade in fresh nuts is reported, as for example between the Krian and Larut Districts of Perak and between Pontian and Johore Bahru in Johore. It is also reported that there is at present a profitable export trade in fresh nuts from part of the west coast of Johore by way of Singapore to China.

Pineapples.—Fresh fruit was plentiful and cheap during the month. Price ranges in Johore were: first quality $1.10 to $1.50, second quality 90 cents to $1.10, and third quality 50 cents to 60 cents per hundred. Corresponding prices in Singapore were $1.60 and 50 cents. In Johore 8, in Singapore 5 and in Selangor 2 factories were working full time.

There was some tendency for fruit to be over-ripe, as growers were holding back supplies in the hope of better prices.

Inspection of the area of some 2,000 acres of pineapples at Mandai in Singapore Island showed that most of the fruits obtained were small, varying in weight from about 2½ to 3 lbs. each. This is not surprising as the plants

are 4 years old, have been grown without manure and with no precautions to prevent soil erosion.

From Johore it was reported that Chinese squatters were going further afield in search of land for pineapple cultivation and had commenced to clear abandoned *lallang* grass land beyond the 30th mile on the Johore—Ayer Hitam road.

Fruit.—Durians, mangosteens, rambutans and chempedaks were in season in Penang and Province Wellesley. Crops were only moderate and prices in consequence were good. The durian crop was light in Kedah. Durians were also fruiting in Selangor and were in season with mangosteens in Singapore Island, but in Malacca were just beginning to ripen. A poor season for mangoes and horse-mangoes concluded in Malacca and a small crop of horse-mangoes was harvested in Negri Sembilan.

Tobacco.—Prices for sun-dried leaves have remained much the same as in May, being high at $30 to $70 per picul in Malacca, Johore and Kelantan, and low at $9 to $25 per picul in Kedah, the range elsewhere being $15 to $40 per picul.

In one district of Malacca the planted area has diminished owing to the impossibility of continuous cropping on the same land. In Kedah a further 22 acres were planted. In Kluang and Batu Pahat Districts of Johore there has been some additional planting, while small scattered plots have also been planted in parts of Selangor and Pahang for local consumption. There is still a considerable planted area in Central Perak.

Agricultural Stations.

The monthly output of made tea from the Tanah Rata Experiment Station during the last six months has averaged about 1,380 lbs. The rate of yield from the area in plucking has been about 630 lbs. per acre from the bushes averaging 6 years old and 300 lbs. per acre from the younger bushes about 3 years old, the age being reckoned in each case from the date of planting in the field.

At the Pineapple Experiment Station in Singapore, the results of the manurial experiment for the period August 1932 to April 1934 indicate that on this soil significant increase in the number of fruits were obtained from applications of various mixtures of fertilisers and from cattle manure. Phosphate was found to be essential. The plots receiving lime only and pineapple refuse only gave no increase. The results also indicate that the effect of manures is practically exhausted 18 months after application.

Poultry keeping has been commenced at the Kuala Lipis Agricultural Station with six pullets and one cockerel of the White Wyandotte breed received from the Pineapple Station, Singapore.

Padi Stations and Test Plots.

Nurseries were established and cultivation of the land commenced at the Telok Chengai Station in Kedah, Titi Serong and Talang Stations in Perak, the Central Experiment Station in Kelantan and thirteen other Test Plots in various parts of the country. The latter include newly-acquired Test Plots in the Bagan Serai mukim of Krian District and the Kuala Lipis District of Pahang.

The crops planted at the Bukit Merah Test Station in Province Wellesley during the interval between padi seasons were nearing maturity. The best growth was shown by brinjals, chillies, ladies' fingers and tobacco.

At the Kilanas Station in Brunei in the Radin Siak Latin square the three strains Rs. 17, 18 and 24 were all significantly superior to Rs. 7.

Poultry.

Two flocks of birds were destroyed in Krian District during April by a disease diagnosed as *Diptheritic Stomotopharyngitis*. In June, there were outbreaks of disease in the Selama and Tanjong Malim Districts of Perak. The cause of the former was not diagnosed, the latter is still under investigation by the Veterinary Department. Three other outbreaks occurred in the Kuala Lipis District of Pahang, specimens from which were obtained by the Veterinary Department for examination. In the Kota Tinggi District of Johore fairly heavy loss was occasioned by disease in three areas where numbers of birds are reared for the Singapore market. This outbreak was reported to the Veterinary Surgeon. Weather conditions may have been a predisposing factor, since storms of wind and rain were prevalent during the month.

A few Malays have started erecting improved types of poultry houses and others have obtained from the Agricultural Stations pure bred or half bred cocks with a view to improving their stock of birds.

Malayan Exhibition.

The remarkable success obtained by competitors from the Settlement of Penang in the agricultural section of the recent Malayan Exhibition is illustrated by the fact that the Settlement received no less than 50 first and 50 second prizes. These included, in addition to the first prize in the All-Malayan Padi Competition, the first prize for copra from small holdings and the first prize for hill padi. A Chinese land-owner in Penang Island obtained no less than 10 first and 4 second prizes, including first prizes for cloves, nutmegs and black pepper.

Rural Lecture Caravan.

The Rural Lecture Caravan visited the Larut District of Perak for the period June 14th to 25th inclusive. The demonstrations, which dealt mainly with poultry keeping and control of mouldy rot disease of rubber, were well attended.

DEPARTMENTAL NOTES.

Death of Inche Mohamed Ali bin Mohd. Said.

We have to record with regret the sudden death of Inche Mohamed Ali bin Mohamed Said, Malay Agricultural Assistant, which took place on 4th June, 1934.

Inche Mohamed Ali joined the Department of Agriculture in 1928. At the time of his death he was a promising member of the laboratory staff. His early demise is regretted by his large circle of friends and colleagues at the Department.

Tour of Director of Agriculture.

The Hon'ble The Director of Agriculture, S.S. and F.M.S. visited Singapore and Johore with the Vegetable Oils Committee from 7th to 10th June inclusive. Meetings were held at Singapore, Kukub, Batu Pahat and Muar.

Conference of Field Officers.

A meeting of Field Officers was held in Kuala Lumpur on 4th June 1934 and the following is a brief résumé of the more important points discussed.

Poultry.—The policy to be adopted in relation to the distribution of poultry from Agricultural Stations was discussed.

Among other decisions made it was agreed that it was essential to distribute selected poultry and that three-quarter-bred cocks should be raised for experimental distribution, such birds as were distributed to be kept under observation.

It was also decided that pure-bred hens may be sold, provided that prospective purchasers already possess a pure-bred cock. A list of prices to be charged for stock was drawn up, reduced prices being allowed to approved small-holders.

All-Malayan Padi Competition.—The rules for this competition were considered and amended in the light of experience gained during the first competition recently completed.

Asiatic Rubber Instructors.—The scheme and course of training of these instructors was outlined. Although actually officers of the Rubber Research Institute of Malaya, it was agreed, in order to obtain closer liaison between that Institute and the Department of Agriculture, that the Instructors should work directly under the field officers of the latter Department.

Small-holders' Rubber.—A scheme was proposed and discussed for a competition for small-holders' rubber on the lines of the All-Malayan Padi Competition with local shows and a Central Competition at the Annual Malayan Exhibition.

Appointments.

Mr. C. H. Burgess, B.Sc. (Agr.) has been appointed an Agricultural Officer from 11th May. He arrived in Malaya and assumed duty on 9th June, 1934.

Mr. Burgess will be stationed at Kuala Kangsar as Agricultural Officer, Perak Central.

Mr. W. G. Higgins, Assistant to Statistician, has been appointed an Agricultural Field Officer on a temporary basis from 29th April, 1934.

Leave.

Mr. J. H. Dennett, Assistant Chemist (Soils), has been granted 7 months and 7 days full-pay leave from 13th June 1934, inclusive.

Mr. J. W. Jolly, State Agricultural Officer, Pahang, has been granted 9 months and 1 day full-pay leave from 19th June 1934, inclusive.

Major C. D. V. Georgi, O.B.E., Assistant Agricultural Chemist, has been granted 8 months and 24 days full-pay leave from 23rd June 1934, inclusive.

Agricultural Leaflets.

A new series of Agricultural Leaflets is in course of preparation and when complete will comprise the following :—

1. Tuba Root
2. Gingelly
3. Tobacco
4. Groundnut or Peanut
5. Bananas
6. Cover Crops
7. Green Manures
8. Fodder Grasses
9. Pepper
10. Coffee.

Of these Nos. 1, 2, 4, 5, and 9 have already been published and will be supplied free of charge on application to the Department of Agriculture, S.S. and F.M.S., Kuala Lumpur.

Statistical.

MARKET PRICES.

June, 1934.

Rubber.—The price of rubber was reasonably stable during June and improved from 20 cents per lb. for spot loose in Singapore to 22⅝ cents per lb. at the close. The average price for the month in Singapore of smoked sheet, equal to London Standard was 21.82 cents per lb. as compared with 21.35 cents per lb. in May. In London the average price in June was 6.46 pence per lb. and in New York 13.36 cents gold per lb. as compared with 6.38 pence and 11.94 cents gold respectively in May.

Weekly prices paid during June for small-holders' rubber at three centres are shown in Table II.

Palm Oil.—The market has again dropped and its course during June is shewn in the following table of the Malayan commodity: basis 5 per cent. f.f.a.

Table I.

DATE	PALM OIL		KERNELS
	L'Pool/Holland/ Hamburg c. i. f. landed weights in bulk per ton £. s. d.	L'Pool/Continent c. i. f. per ton net in barrels £. s. d.	Fair Average Malayan Quality c. i. f. Landed Weight per ton on Continent. £. s. d.
June 6	8 15 0	11 10 0	5 15 0
„ 13	9 0 0	11 10 0	5 15 0
„ 20	9 0 0	11 10 0	5 15 0
„ 27	9 0 0	11 10 0	5 15 0

Copra.—The price of copra in Singapore again appreciated slightly during June, closing at $2.95 for sun-dried copra, after touching $3.00. The average price for the month of this grade was $2.93 as compared with $2.83 for May. The mixed quality averaged $2.51 as compared with $2.35 in the previous month.

Copra cake continued to be quoted at $1.00 a pikul throughout the month.

Rice.—The average wholesale prices of rice per picul during May were as follows:—Siam No. 2 (ordinary) $2.60, Rangoon No. 1 $2.42, Saigon No. 1 (long grain) $2.50 as compared with $2.54, $2.42 and $2.57 respectively in April. Corresponding prices in May 1933 were $3.57, and $2.92 for Siam No. 2 and Rangoon No. 1 respectively.

The average retail market prices in cents per gantang of No. 2 Siam rice in May were:—Singapore 23, Penang 25, Malacca 23 as compared with 23, 25 and 24 respectively in April.

The average declared trade value of imports of rice in May was $3.10 per picul as compared with $3.11 in March and $3.00 in April of this year.

Tea.—The London price quoted for Malayan tea during May was 1s. 1½d. per lb. Average London prices per lb. during May for tea consignments from other countries were as follows:—Ceylon 1s. 2.93d., Java 11.97d., Indian Northern 1s. 1.58d., Indian Southern 1s. 2.27d., Sumatra 11.54d. Prices generally shewed some decline over those ruling during the previous month.

Tuba Root (Derris).—Prices continue to advance. The average price during June for roots of good ether extract was $30.50 per picul. Roots sold on rotenone content averaged $40 per picul.

Coffee.—The Singapore price of coffee weakened during June. Sourabaya coffee dropped from a range of $20 to $21 per picul according to grade, to $19 to $20 and Palembang coffee dropped from $13.50 per picul to $12.50, an average of $12.85 as compared with $16.19 in May.

Arecanuts.—Singapore average prices per picul during June were as follows:—Splits $2.75 to $4; Bila Whole $2.60; Sliced $12.50 to $16.35; Red Whole $4 to $5.65; Sourabaya Whole $4.35 to $5.90; Kelantan Whole $3 to $3.63, the price within each range depending upon quality.

The average prices per picul quoted by the Singapore Chamber of Commerce were:—Best $4.06, Medium $3.71, Mixed $3.07.

Gambier.—Singapore prices have weakened slightly since the beginning of June, but the average price for Cube No. 1 for the month was $7.30 per picul as against $7.19 in May, while the average price for Block dropped to $4.05 from $4.25 for May.

Pineapples.—Rather more enquiry in London early in the month resulted in a small temporary advance, the demand tending to slacken towards the close of the month. The average price of Cubes per case for June was $3.01 as compared with $3.02 in May but Sliced Flat and Sliced Tall grades both shewed a slight increase at $3 and $3.12 respectively as compared with $2.97 and $3.07 in May.

Tapioca.—Singapore prices opened at the May level but eased off considerably during the month. Average prices per picul were Flake Fair $4.33, Pearl Seed $5.86, Pearl Medium $6.20 as against $4.60, $5.91 and $6.37 respectively in May.

Sago.—The Singapore market in this commodity during June resembled that for tapioca. Average prices per picul were Pearl, Small Fair $4.17 and Sarawak Fair $1.86 as compared with $4.76 and $1.90 in May.

Mace.—The Singapore market for mace and nutmegs continued dull and featureless during June. Prices remained steady at $70 per picul for Siouw and $50 per picul for Amboina, unchanged as compared with May.

Nutmegs.—The Singapore prices per picul were steady during June at $22.53 for 110's and $23.50 for 80's. The corresponding average prices in May were $22.50 and $23.

Pepper.—The market settled down again after the May fluctuations and prices eased off considerably. London stocks seem to increase steadily. Singapore average prices per picul in June were :—Singapore Black $14.85, Singapore White $33.60, Muntok White $34.40 as compared with May average prices of $16.19, $34.75 and $35.75 respectively.

Cloves.—Prices in Singapore continued nominal at Zanzibar $35 and Amboina $45 per picul.

Table II.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, June, 1934.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.			Kuala Kangsar, Perak.				Batu Pahat Johore
	7	14	21	6	13	20	27	27
Smoked sheet			24.50					
Unsmoked sheet	22.62	23.19	23.45					22.56
Rubber*				20.00	22.84	22.00	22.00	

*Wet unsmoked sheet.

Transport by lorry Kuala Pilah to Seremban 15 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Batu Pahat on 6th, 13th and 20th June or at Kuala Pilah on 28th June.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackey & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

May, 1934.

Malaya.—The imports into Malaya of foreign rice during May were 49,534 tons and exports 11,688 tons, net imports accordingly being 37,846 tons. The net imports for the period January to May 1934, were 186,155 tons, an increase of 10.1 per cent. over the corresponding five months of 1933.

Of May imports, 47 per cent. were consigned to Singapore, 21 per cent. to Penang, 5 per cent. to Malacca, 20 per cent. to the Federated Malay States and 7 per cent. to the Unfederated Malay States. Of the total, 65 per cent. came from Siam, 33 per cent. from Burma, 1 per cent. from French Indo-China and 1 per cent. from other countries. Of the exports during May, 67 per cent. were shipped to Netherlands India and 33 per cent. to other countries.

The various kinds of rice exported were :—Siam 7,460 tons (64 per cent.), Burma 3,575 tons (31 per cent.), Indo-China 454 tons (4 per cent.), India 39 tons, local production 160 tons (1 per cent.)

India, Burma and Siam.—Latest information available published in the Summary for April, 1934.

Japan.—According to the Ministry for Agriculture and Forestry (*Trans-Pacific Journal,* 17 May, 1934) the stocks of rice in Japan Proper on 1 May, 1934, amounted to 6,406,310 tons.

The demand and supply of rice during the period 1 May, 1934 to 31 October, 1934, were estimated as follows :—

Supply :	Stocks on 1 May, 1934	6,406,310	tons
	Imports of Korean rice	434,780	,,
	Imports of Formosan rice	322,580	,,
Demand :	Six months' consumption (May/October)	4,679,240	tons
	Exports	70,130	,,

shewing a surplus of 2,414,300 tons.

French Indo-China.—Entries of padi into Cholon, January to May, 1934 totalled 598,252 metric tons as compared with 599,508 metric tons during the corresponding period in 1933, a decrease of 0.2 per cent. Exports of rice for the same period this year were 664,724 metric tons, as compared with 652,116 metric tons for the corresponding period in 1933, or an increase of 1.9 per cent.

Netherlands India.—According to the *Economic Bulletin* dated 16 May, 1934, the area of padi harvested (wet and dry) in Java and Madoera during February, 1934, amounted to 541,671 acres, as compared with 422,617 acres in the corresponding period of 1933, an increase of 28 per cent.

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*Abridged from the Rice Summary for May, 1934, compiled by the Department of Statistics, S.S. and F.M.S.

Ceylon.—Imports for the first five months of 1934, totalled 194,942 tons, an increase of 8.1 per cent. as compared with the total of 179,182 tons for the same period in 1933.

Of these imports, 15 per cent. were from British India, 65 per cent. from Burma and 20 per cent. from other countries.

Europe and America.—Shipments to Europe from the East were 512,230 tons for the period 1 January to 17 May, 1934 as compared with 592,900 tons for the corresponding period in 1933, a decrease of 13.6 per cent.

Of the 1934 shipments 42 per cent. were from Burma, 3 per cent. from Japan, 40 per cent. from Saigon, 11 per cent. from Siam and 4 per cent. from Bengal. The corresponding 1933 percentages were 50, 4, 38, 7 and 1 per cent. respectively.

Shipments from the East to the Levant during the period 1 January to 26 April, 1934, were 16,360 tons as compared with 13,891 tons for the same period in 1933, an increase of 17.8 per cent.

To the West Indies and America, 46,385 tons were shipped from the East in the period January to May, 1934, as compared with 40,745 tons during the corresponding period in 1933, an increase of 13.8 per cent.

MALAYAN AGRICULTURAL EXPORTS, MAY, 1934.

PRODUCT.	Net Export in Tons.				
	Year 1933.	Jan.-May 1933.	Jan.-May 1934.	May 1933.	May 1934.
Arecanuts ...	20,756	9,185	15,521	1,236	2,974
Coconuts, fresh ...	100,609†	37,665†	37,735†	7,013†	6,250†
Coconut oil ...	17,568	7,907	10,750	1,595	2,419
Copra ...	110,543	35,751	38,352	6,591	5,023
Gambier, all kinds ...	2,560	1,040	913	291	220
Palm kernels ...	1,983	612	1,142	194	280
Palm oil ...	12,101	3,753	4,950	1,452	1,038
Pineapples canned ...	59,582	24,577	29,514	6,942	8,854
Rubber ...	459,836§	149,653§	210,672§	33,461§	46,769§
Sago,—flour ...	7,648	1,836	4,131	307	728
„ —pearl ...	2,646	886	1,775	221	468
„ —raw ...	4,420*	1,688*	2,400*	271*	637*
Tapioca,—flake ...	9,881	5,112	3,585	977	613
„ —flour ...	702*	181*	898*	137*	227*
„ —pearl ...	17,297	6,952	6,852	1,352	1,606
Tuba root ...	569½	182	258½	56	43

† hundreds in number. * net imports. § production.

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING MAY, 1934.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1932 (*d*)	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING		AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,734	1,106	2.5	7,717	17.2	872	1.9	8,823	19.7
Dindings	6,,969	112	1.6	1,287	18.5	506	7.3	1,399	20.1
Malacca	111,780	4,254	3.8	20,092	18.0	4,303	3.9	24,346	21.8
Penang Island	1,635	260	15.9	332	20.3	7	0.4	592	36.2
Singapore Island	28,269	4,837	17.1	4,506	15.9	738	2.6	9,343	33.0
Total S.S. ...	193,387	10,596	5.5	33,934	17.5	6,426	3.3	44,503	23.0
FEDERATED MALAY STATES :—									
Perak	250,951	4,747	1.9	40,192	16.0	13,893	5.5	44,939	17.9
Selangor	308,379	3,024	1.0	47,763	15.5	13,406	4.3	50,787	16.5
Negri Sembilan	228,541	9,171	4.0	37,069	16.2	19,950	8.7	46,240	20.2
Pahang	38,141	2,492	6.5	11,366	29.8	6,132	16.1	13,858	36.3
Total F.M.S. ...	826,012	19,434	2.4	136,390	16.5	53,381	6.5	155,824	18.9
UNFEDERATED MALAY STATES :—									
Johore	325,747	16,672	5.1	27,678	8.5	21,498	6.6	44,350	13.6
Kedah (*a*) (*b*)	126,588	10,292	8.1	12,704	10.0	15,574	12.3	22,996	18.1
Kelantan	21,176	1,209	5.7	5,572	26.3	3,758	17.7	6,781	32.0
Trengganu (*c*)	4,643	Nil	Nil	186	4.0	186	4.0	186	4.0
Perlis (*a*) (*b*)	957	159	16.6	192	20.0	318	33.2	351	36.6
Total U.M.S. ...	479,111	28,332	5.9	46,332	9.7	41,334	8.6	74,664	15.6
TOTAL MALAYA ...	1,498,510	58,335	3.9	216,656	14.4	101,141	6.7	274,991	18.3

Notes :—(*a*) Registered companies only and are rendered quarterly.

(*b*) The figures quoted for Kedah and Perlis are those for end December 1933, and Kelantan end January, 1934. Revised figures will be published when available.

(*c*) Registered Companies only.

(*d*) Figures for end December 1933, are not yet available.

MALAYA RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF MAY, 1934 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
								during the month		January to May inclusive 1934		during the month		January to May inclusive 1934				
	Ports	Dealers	Estates of 100 acres and over	during the month	January to May inclusive 1934	during the month	January to May inclusive 1934	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	14,254	8,742	11,658	57,006	12,116	54,404	Nil	Nil	Nil	Nil	20,703	21,256	83,130	48,840	...	976	3,807
Johore ...	...	3,694	2,879	3,850	18,374	6,499	25,828	Nil	62	Nil	78	2,341	13,445	8,911	40,658	...	222	976
Kedah ...	...	378	1,556	2,723	13,719	2,592	9,085	Nil	Nil	Nil	Nil	1,411	5,396	7,482	17,712	...	6	436
Perlis ...	...	27	20	21	72	25	172	Nil	Nil	Nil	Nil	Nil	89	Nil	283	...	Nil	4
Kelantan ...	...	389	164	231	1,120	903	4,311	Nil	Nil	319	Nil	118	1,508	487	5,620	...	Nil	61
Trengganu ...	...	55	50	368	1,233	185	614	Nil	Nil	Nil	Nil	Nil	551	Nil	1,847	...	55	50
Total Malay States	...	18,797	13,411	18,851	91,524	22,318	94,414	Nil	62	319	78	24,573	42,245	100,010	114,960	...	1,259	5,334
STRAITS SETTLEMENTS :-																		
Malacca ...	...	3,582	892	1,254	6,531			Nil		3		4,633		18,673		...	551	369
Province Wellesley	...	2,291	421	455	2,578			Nil		Nil						...	12	144
Dindings ...	...	77	103	108	528	3,576	14,158	Nil	37,140	Nil	103,737	8,529	Nil	24,669	Nil	...	1	22
Penang ...	1,777	7,002	4	14	58			2,604		10,729						4,719	14,281	3
Singapore ...	9,403	39,249	137	193	881			23,087		86,659						11,858	58,336	82
Total Straits Settlements	11,180	52,201	1,557	2,024	10,576	3,576	14,158	25,691	37,140	97,391	103,737	44,726	Nil	197,474	Nil	16,577	73,181	620
TOTAL MALAYA	11,180	70,998	14,968	20,875	102,100	25,894	108,572	25,691	37,202	97,710	103,815	69,299	42,245	297,484	114,960	16,577	74,440	5,954

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	427	45,593	11,330	429	70	1
WET RUBBER	549	12,743	2,951	135	152	5
TOTAL ...	976	58,336	14,281	564	222	6

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to May 1934
Singapore ...	46,780	194,058
Penang ...	12,934	66,176
Port Swettenham.	8,843	33,579
Malacca ...	742	3,671
MALAYA ...	69,299	297,484

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to May 1934
Malay States ... / Straits Settlements	45,975	205,735
MALAYA ...	45,975	205,735

Notes :—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [9] = Columns [15] + [16] + [19] + [20] + [21] + [22] —[4]—[5]—[6]—[7]—[11]—[12]. For the Straits Settlements, Columns [9] and [10] represent purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4 Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month.

5. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 25 June,

METEOROLOGICAL SUMMARY, MALAYA, MAY, 1934.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.	Mean of A and B.	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	91.9	72.3	82.1	96	70	83	75	84.6	85.2	3.99	101.4	1.41	15	9	3	5		220.75	7.12	58
Bukit Jeram, Selangor ...	88.9	72.9	80.9	91	70	82	75	85.3	86.3	4.84	122.9	1.84	9	8	1	1	1	240.70	7.76	63
Sitiawan, Perak ...	90.5	72.5	81.5	93	69	86	75	84.4	84.9	3.17	80.5	0.76	13	8				225.00	7.26	59
Temerloh, Pahang ...	91.0	72.5	81.7	94	70	86	76	85.3	86.2	5.28	134.1	1.85	14	11		1		240.10	7.75	63
Kuala Lipis, Pahang ...	90.7	71.9	81.3	94	69	86	74	84.7	85.0	3.45	87.6	1.72	8	6	2	21	1	216.05	6.97	57
Kuala Pahang, Pahang ...	88.4	74.6	81.5	93	72	85	78	86.3	85.4	3.37	85.6	1.98	11	9	4			272.25	8.78	71
Mount Faber, Singapore ...	87.9	75.9	81.9	90	71	80	80	82.5	82.3	12.12	307.9	4.23	14	11	2		1	230.45	7.43	61
Butterworth, Province Wellesley ...	87.5	74.4	80.9	90	72	85	76	84.3	85.0	9.84	249.9	2.36	16	14	3		1	200.25	6.46	53
Bukit China, Malacca ...	85.5	74.3	79.9	87	71	81	77	84.6	84.8	7.43	188.7	2.08	16	14	3		1	229.05	7.39	61
Kluang, Johore ...	89.1	71.6	80.3	93	69	82	74	82.2	82.4	2.75	69.9	1.02	13	9		6		210.05	6.78	56
Bukit Lalang, Mersing, Johore	87.9	72.5	80.2	93	70	81	74	82.3	81.9	5.24	133.1	0.98	17	14	3	3		253.65	8.18	67
Alor Star, Kedah ...	87.8	75.0	81.4	91	73	84	76	86.3	85.8	9.45	240.0	3.56	21	16	4		1	230.30	7.43	61
Kota Bahru, Kelantan ...	90.5	73.8	82.1	93	71	81	76	84.8	84.6	6.88	174.8	2.14	17	14	7			241.10	7.78	63
Kuala Trengganu, Trengganu	88.6	73.6	81.1	91	71	82	76	83.8	84.7	4.18	106.2	0.98	15	13	7	1		230.10	7.42	60
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	75.2	63.5	69.3	80	62	69	65	71.3	71.9	2.80	71.1	0.72	10	9	2	3	2	214.10	6.91	56
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	72.3	56.5	64.4	75	50	65	61	70.2	69.7	10.67	271.0	1.83	22	18	1		2	177.00	5.71	46
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.7	59.5	65.6	75	58	62	61			11.61	294.9	2.04	22	18			2	191.85	6.19	50

Compiled from Returns supplied by the Meteorological Branch, Malaya.